Networking Systems
(10102)

Rationale Statement:
The goal of this course is to help students understand and participate in the significant impact of computer networking in their lives. Virtually any career involves the use of technology, and familiarity with computer networking and networking media promotes confidence in the use of computer networking concepts. In addition, this course will encourage students to learn more about how things work and consider pursuing a career in Information Systems, Information Technology, Computer Science, or Computer Networking and related fields of Electronics, Cabling, and Telecommunications.

As stated at www.careerclusters.org: "Careers in Network Systems involve network analysis, planning and implementation; including design, installation, maintenance and management of network systems. Successful establishment and maintenance of information technology infrastructure is critical to the success of almost every 21st century organization. People with expertise in Network Systems are in high demand for a variety of positions in organizations of all sizes and types, doing work such as creating and maintaining the infrastructure in medical facilities that enables multiple doctors to view the same patient's X-rays in real-time to determine the diagnosis and the best treatment."

Course Description:
Networking Systems teaches students advancing concepts of networking and networking media. It establishes the relevancy of networking in our everyday lives. This lab-intensive course will challenge students to design, configure, troubleshoot, and maintain computer networks. It prepares students for entry-level jobs in the networking industry by employing engaging instructional approaches that help them understand general theory and gain practical experience. There will be opportunities for extensive hands-on interaction with computers, networking equipment, and networking media to prepare students for careers or post-secondary continuing education.

Networking Systems will prepare students that are planning on attending a two or four year post-secondary school for Information Systems, Information Technology, Computer Science, or Computer Networking and related fields of Electronics, Cabling, and Telecommunications.

Grade Level: 10 – 12

Topics Covered:
- Network Design and Architecture
- Network Devices
- Network Operating Systems
- Network Configuration
- Network Terminology
- Network Media
- Network Troubleshooting
- Network Maintenance

Core Technical Standards & Examples

Indicator #1: Identify and analyze customer/organizational network system needs and requirements.	
Bloom's Taxonomy Level	**Standard and Examples**
Analyzing	**NS 1.1 Gather data to identify customer/organizational requirements.** Examples: • Match network documentation sources with specific types of information found in them. • Develop a checklist of the business goals of a specific company.
Applying	**NS 1.2 Conduct a computer network needs analysis** Examples: • Identify scenarios appropriate for implementing remote worker support systems. • Create a network organization structure, examining the needs of all stakeholders in the structure.
Creating	**NS 1.3 Develop networking requirements specifications** Examples: • Indicate whether a hierarchical addressing scheme should be used to structure a network. • Create and prioritize technical requirements for a network.
Evaluating	**NS 1.4 Analyze requirements/specifications using current approaches.** Examples: • Compare and contrast the traffic flow patterns of LAN, WAN, and external traffic in an enterprise system. • Create a project plan using the Lifecycle Services approach.

Indicator #2: Perform project management	
Bloom's Taxonomy Level	**Standard and Examples**
Applying	**NS 2.1 Produce strategies and plan to solve the specific network problem.** Examples: • Apply a sequence of planning steps to determine the type and placement of ACLs for specific scenarios. • Based on analysis of test results, produce a plan to minimize risks and weaknesses in a network design.
Creating	**NS 2.2 Create a project plan.** Examples: • Implement a VLSM scheme through a sequence of project planning steps which identify requirements, design the addressing, and analyze the use of network address space. • Using the FilmCompany network design, create a formal test plan for prototyping the LAN.
Applying	**NS 2.3 Manage information system project methodologies** Examples: • Apply considerations and best practices in telecommunications room design to plan placement of MDFs, IDFs and cabling in a specific scenario. • Based on a timeline and customer-caused changes, produce a project variation statement showing a possible delay in project completion date.

Indicator #3: Analyze network system interdependencies and constraints	
Bloom's Taxonomy Level	**Standard and Examples**
Analyzing	**NS 3.1 Analyze the computer site environment** Examples: • Describe telecommunication room power design and considerations. • Explain the process of setting up a customer site visit.
Analyzing	**NS 3.2 Analyze network security systems.** Examples: • Analyze router logs to verify the correct placement of filtering mechanisms. • Determine the appropriate place to provide security functions and appliances.
Evaluating	**NS 3.3 Evaluate the correctness and effectiveness of implementing the network system.** Examples: • Utilize a prototype to examine traffic flow through an enterprise network. • Verify that a network design meets business and technical goals by analyzing the results of prototype tests.

Indicator #4: Demonstrate knowledge of designing a network system.	
Bloom's Taxonomy Level	**Standard and Examples**
Understanding	**NS 4.1 Demonstrate knowledge of the basics of network architecture.** Examples: • Identify and describe the functional components of the Cisco Enterprise Architectures. • Differentiate between the functions of the hierarchical design model and Cisco Enterprise Architectures.
Applying	**NS 4.2 Demonstrate knowledge of basic network classifications and topologies**. Examples: • Identify terminology related to enterprise LANs and WANs. • Select the appropriate LAN topology to meet Distribution Layer requirements.
Understanding	**NS 4.3 Demonstrate knowledge of common network computing platforms** Examples: • Select the components needed to connect a service from the edge to the internal network. • Identify devices, components, and technologies needed to support remote workers through a VPN.
Applying	**NS 4.4 Demonstrate knowledge of LAN physical media.** Examples: • Interconnect network nodes with redundant links to provide reliability at minimal cost. • Characterize a variety of connectivity options as appropriate primary or backup link choices.
Applying	**NS 4.5 Demonstrate knowledge of network connectivity basis and transmission line applications.** Examples: • Identify appropriate cables used to connect MDF and IDFs on a campus diagram. • Identify the design differences between standalone APs and wireless controllers with LWAPs when designing WLAN coverage options.
Applying	**NS 4.6 Demonstrate knowledge of communication standards for networks.** Examples: • Specify the components, in order, needed to connect a service from the edge to the internal network. • Identify the required features of an IP telephony system.

Creating	**NS 4.7 demonstrate knowledge of WAN systems.** Examples: • Configure and verify a PPP connection between two routers. • Configure and test a prototype VPN connection.
Applying	**NS 4.8 Demonstrate knowledge of network security systems.** Examples: • Configure and verify standard and extended ACLs. • Research different security options and make a recommendation.
Analyzing	**NS 4.9 Demonstrate knowledge of Network Operating Systems.** Examples: • Describe the client-server functions of a VPN. • Identify weaknesses in existing use of data center servers, and suggest improvement strategies.

Indicator #5: Perform network system installation and configuration	
Bloom's Taxonomy Level	**Standard and Examples**
Applying	**NS 5.1 Install a system** Examples: • Identify enterprise network documentation that helps to determine system requirements. • Download and install Cisco IOS software.
Applying	**NS 5.2 Perform software loading and configuration.** Examples: • Configure server and client functions in a VTP domain. • Using Cisco SDM, explore the configuration options available to create a Cisco EasyVPN Server.

Indicator #6: Perform network administration and monitoring.	
Bloom's Taxonomy Level	**Standard and Examples**
Creating	**NS 6.1 Monitor the information/network system.** Examples: • Design a network and create a baseline. • Use a software program to monitor network performance.
Evaluating	**NS 6.2 demonstrate knowledge of disaster recovery and business continuance** Examples: • Determine the size and impact of various failure domains on network connectivity. • Identify the availability strategies that will improve network availability and limit the effects of failures.
Applying	**NS 6.3 Perform network system administration tasks.** Examples: • Use logging to verify ACL functionality. • Rank network traffic based on identified priorities.

Indicator #7: Perform network maintenance and user support services.	
Bloom's Taxonomy Level	**Standard and Examples**
Applying	**NS 7.1 Identify technical support needed.** Examples: • Identify and use various types of network monitoring and maintenance tools, such as ping, traceroute, and packet sniffing. • Use a variety of Cisco IOS and Windows commands to provide information necessary to test network functionality.
Applying	**NS 7.2 Perform technical support needed.** Examples: • Add a new switch into a VTP domain. • Create a Bill of Material including software IOS support.
Creating	**NS 7.3 Perform software upgrades and fixes.** Examples: • Identify the enhancements to distance vector routing provided by migrating to EIGRP. • Update an existing Cisco IOS
Evaluating	**NS 7.4 Perform standard computer backup procedures.** Examples: • Distinguish between the impact of internal backup operations and external backup and recovery on network traffic patterns. • Back up current configurations as preparation for an IOS upgrade.
Creating	**NS 7.5 Perform network system maintenance.** Examples: • Create a network performance baseline. • Create a maintenance schedule for a network installation.
Evaluating	**NS 7.6 Troubleshoot problems.** Examples: • Match a problem with the OSI layer with which it is best associated. • Troubleshoot a frame relay connection to ensure that failover works as expected.
Applying	**NS 7.7 Troubleshoot data communications.** Examples: • Troubleshoot host connectivity on a switch. • Induce link failures as part of a test plan, and resolve redundancy issues to meet design requirements.